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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,061	10/06/2003	Keitaro Imai	243648US2S	4099
22850	7590	01/06/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			CHU, CHRIS C	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 01/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

10/678,061

Applicant(s)

IMAI ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 - 24 is/are pending in the application.
- 4a) Of the above claim(s) 2, 4, 6, 8, 10, 12, 14 AND 16 - 24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 5, 7, 9, 11, 13 and 15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/20/04</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Group I and Species II in the reply filed on November 22, 2004 is acknowledged.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 5, 9 and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Kim (U. S. Pat. No. 6,744,090).

Regarding claim 1, Kim discloses in e.g., Fig. 2G and column 4, line 63 – column 5, line 17 a semiconductor device comprising:

- a semiconductor substrate (semiconductor substrate under the elements 100 and 105; column 3, lines 61 - 62);
- a conductive plug (105; column 4, line 6) electrically connected to the semiconductor substrate;
- a silicon carbide film (120; column 4, line 64) provided on the conductive plug;

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- a metal compound film (145; column 5, line 3 – 5) provided on the silicon carbide film and containing a metal carbide (TaC; column 5, line 4); and
- an electrode (160; column 5, lines 11 – 12) provided on the metal compound film.

Regarding claim 5, Kim discloses in e.g., Fig. 2G and column 4, line 63 – column 5, line 17 the metal carbide (145; column 5, line 3 – 5) containing carbide of tantalum (TaC; column 5, line 4).

Regarding claims 9 and 13, Kim discloses in e.g., Fig. 2G and column 4, line 63 – column 5, line 17 the metal compound film (145 and adhesive layer; column 5, line 3 – 17) further containing a compound of a metal contained in the metal carbide (TaC; column 5, line 4) and silicon (TiSiN; column 5, lines 13 – 17).

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3, 7, 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Geffken et al. (U. S. Pat. No. 6,680,514).

Regarding claim 3, while Kim discloses the conductive plug on the surface of the semiconductor substrate, Kim does not disclose the conductive plug being electrically connected to an active region of a transistor provided on the surface of the semiconductor substrate.

Geffken et al. teaches in e.g., Fig. 10 a conductive plug (63) being electrically connected to an

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active region (33) of a transistor (31, 33 and 32) provided on the surface of a semiconductor substrate (16). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Kim by forming the active region of a transistor of Geffken et al. between the conductive plug and the surface of the semiconductor substrate for electrical connection as taught by Geffken et al. The ordinary artisan would have been motivated to modify Kim in the manner described above for at least the purpose of conductively coupling the electronic device represented by the FET to other conductive structure in or above interlevel dielectric layers (column 9, lines 5 – 10).

Regarding claim 7, Kim discloses in e.g., Fig. 2G and column 4, line 63 – column 5, line 17 the metal carbide (145; column 5, line 3 – 5) containing carbide of tantalum (TaC; column 5, line 4).

Regarding claims 11 and 15, Kim discloses in e.g., Fig. 2G and column 4, line 63 – column 5, line 17 the metal compound film (145 and adhesive layer; column 5, line 3 – 17) further containing a compound of a metal contained in the metal carbide (TaC; column 5, line 4) and silicon (TiSiN; column 5, lines 13 – 17).

### *Conclusion*

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hawley et al., Nagasu et al., Van Buskirk et al., Nishioka et al., Jiang et al. and Subramanian et al. disclose conductive plugs and silicon carbide middle layer on a semiconductor substrate.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is 571-272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 517-272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu  
Examiner  
Art Unit 2815

c.c.  
Tuesday, December 21, 2004

  
GEORGE ECKERT  
PRIMARY EXAMINER